

RESTORATION OF BREACHES USING CALENDER HAMILTON SPAN ON BRIDGE NO 194 IN KZJ-BPQ SECTION OF SC RAILWAY

by
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SYNOPSIS

On Indian Railways various methods are being using to restore the traffic as early as possible to avoid the passenger's discomfort, Since they are beloved customers. To restoring the through communication the civil engineering part is very vital. In that if any bridge is involved the bridge Engineering is playing vital role to restore the Traffic. In this paper we are trying to give some points which are useful for incoming and brethren engineers regarding using of Calendar Hamilton Bridge in accident spot for speedy restoration.

1) INTRODUCTION

- During the year 2000, in early hours of 28th Aug, the kumarikunta tank breached due to heavy concentrated rain fall.
- The flood hit the Br no 194 span 3X12.20 m plate girder in KZJ-BPQ section on S C Railway.
- The up line Bridge completely washed away and down line piers are leaned due to scour.

- Total clear span of DN line bridge = $3 \times 42'$ (overall length) + 6 for gaps = 132 feet.

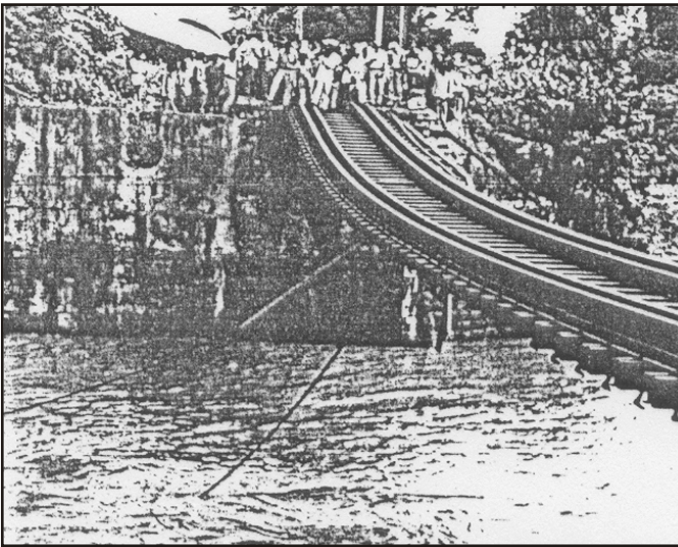
Hence the standard CH span of 155 feet effective span was adopted.

2) HISTORY OF CH SPAN

The CH span is designed and patented by Civil Engineer Hamilton during 1935 while he was in charge for Iraq-Kurdistan high way. He collaborated With British Insulated Callenders Cables, now Balfour Beatty Power Networks Ltd, and designed the Callender-Hamilton Bridge System, the income from which helped support his family. This system is mostly used when heavy breaches occurred and flash flood expected in very short period. Since the construction at site is easy and the components that could easily be transported and erected in remote and/or difficult terrain.

3) ADVANTAGES OF CHS PANS

- The design was centered on a series of gusset plates that allowed the direct attachment of the longitudinal, diagonal, vertical, and cross framing members.
- The centralizing of connection points increased the speed of construction and also allowed identical panels to be fabricated from identical members and then installed on site
- Since the gusset plate carried the direct attachment of the vertical, diagonal, and cross members, the lateral stiffness carried by the floor beams is isolated and thereby increased
- The members and connection points are modular in



A View of the hanging track on the up line bridge

- Due to these both up and down line traffic was held up.
- Being busy and prestigious GT route it was decided that upline to be restored with temporary girder on steel cribs and down line to be restored with semi permanent calendar Hamilton Bridge, since expected heavy rain fall and flooding in this area.

that many similar components could be erected to meet various applications.

- Truss panels that are stacked on top of each other can easily be attained by attaching two prefabricated gusset plates together, forming a central location for all connection members
- CH Spans are designed for the purpose of building long spans as rapidly as possible to use in place of standard spans damaged due to accidents, floods or enemy action.
- This is also used in case of washed away of multiple spans and there is no chance of erecting the temporary substructure in the river bed.

4) TIME ESTIMATION

S.no	Description	100'	150'	200'
1	Cleaning of site	1day	1day	1day
2	Nomenclature wise stacking of parts	1day	2days	2days
3	Preparation of site and laying of temp track	3days	4days	6days
4	Erection and dismantling of CH span derrick	4days	4days	4days
5	Assembling and erection of CH span	12days	20days	30days
6	Return of equipment, laying of track over CH etc	1day	2days	3days
	TOTAL	22days	33days	47days

5) LIST OF DRAWING NOS FOR ASSEMBLING AND ERRECTION

SL NO	DESCRIPTION	DRAWING / PLATE NO
1	Trained personnel	1
2	List of Erection materials, Gears & tools	2
3	List of equipments	3
4	Assembly of DRG for double Intersection	4
5	Assembly of DRG for single Intersection	5
6	Assembling drawing for under slung Type	6

SL NO	DESCRIPTION	DRAWING / PLATE NO
7	Key diagram for bearing dimension	7
8	Splicing arrangements for top and Bottom chord	8
9	Carrying capacity for Each member	9
10	Part list for BG 200',150',100',80'	10 to 13
11	Part list for 60' girder	14
12	Part list for MG 200',150',100',80'	15 to 18
13	Part drawings	19 to 46
14	Errection drawing	47 to 53
15	Using trolleys, skids, machineries	54 to 59
16	Special launching drawing	60 to 71

6) LIST OF MATERIALS AS PER PLATE NO 3

Sr. No.	Toos and Equipments and Machinery	No.
1	140 T capacity MFD cranes	2
2	40 T capacity road cranes.	2
3	Proclainers.	2
4	Winches 20 T capacity.	2
5	Winches 10 T capacity	2
6	Wire ropes bundles 1" dia..	1500M
7	Hydraulic jacks 200 t cap..	3
8	Simplex jacks.	6
9	Mechanical jacks 50 t cap.	2
10	Dip lorries / Materials trollies. Nos.	2SETS/2Nos
11	Polypropylene rope /Manila ropes.	4 BUNDLES
12	Wooden sleepers for staging/ matting.	1000
13	CC cribs	1200
14	Cut wooden blocks	100
15	Pulley blocks of 1" dia. Wire ropes 3 sleeve	5
16	Pulley blocks of 1" dia. Wire ropes 2 sleeve	5
17	Pulley blocks of 1" dia. Wire ropes 1 sleeve	20
18	Safety belts	20
19	Safety helmets	4

Sr. No.	Toos and Equipments and Machinery	No.
20	Ladders	AS REQUIRED
21	Tractors/Lorries for transportation of the boulders and materials.	—DO—
22	'D' Shackles	—DO—
23	Spanners of sizes	—DO—
24	Crow bars and Tommy bars	—DO—
25	CH span assembling tools	—DO—
26	Chains and wires	—DO—
27	Scaffoldings arrangements like pipes/hooks	—DO—

Sr. No.	Description of Work	BRI Staff	PWAY Staff	DAYS
4	Shifting of CH span parts to assembly site, assembling, erection of CH span and launching including threading and tightening of bolts and dismantling of launching nose, 3 shifts in a day			40
5	Track linking and strengthening and guarding	40		5
Total 15 days from 1-9-2000 to 15-9-2000				
Note. Activity 1 and 2, 3, 4 & 5 simultaneously carried out by BRI staff and P way staff.				

7) DIFFERENT TYPE OF BEARINGS USED

There are two type of bearings used in a CH span

1. FLAT type:-This type of bearing is used for under slung type of girder
2. ROCKER type: - This type of bearing is used for semi through and through type of girder.

8) ARRANGEMENTS

- Required number of steel cribs and wooden sleepers and other P.Way materials are moved to the site for restoration of up Line Bridge.
- And arrangements are made for moving the calendar Hamilton Bridge materials required for 155' Span from Jalander Cantonment (N.RLY) by material train on emergency basis to the site and unloaded at site for assembling.

9) MANPOWER PLANNING

Sr. No.	Description of Work	BRI Staff	PWAY Staff	DAYS
1	Errrection of cribs as abutment and unloading of CH span materials	120		3
2	Preliminary arrangements and laying of auxiliary track		40	7
3	Laying of auxiliary track at KZJ end and casting of foundations for winches and straining and restraining arrangements in 3 shifts in a day	120		12

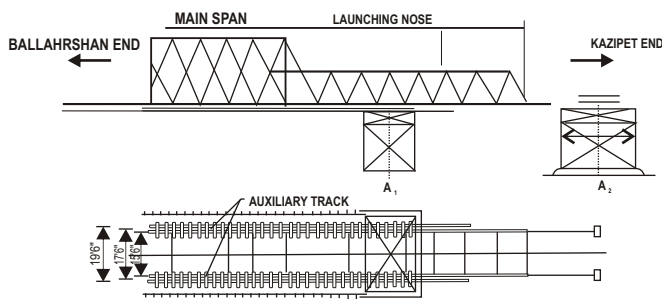
10) PRELIMINARY WORKS

- Cutting and leveling of formation on approaches for auxiliary track (Twin Track) for erecting of CH span. The leveling has been done for a length of 70 m on BPQ approach and 50m on KZJ approach for easy movement of CH Bridge.
- Linking of auxiliary track over wooden blocks at 15'6`` center to center of inner rail and 19'6`` center to center of outer rails on both approaches along the proposed center line of CH span.
- Leveling and packing of auxiliary track on both sides.
- Excavation and leveling of earth work for two cribs staging on both the approaches for laying of auxiliary track.
- Errrection of crib staging of 9.00mX3.6 m base and 3.6m in height over two layers of matting with wooden sleepers on the leveled surface. And the cribs are properly secured.
- Extension of auxiliary track over the crib staging on both sides in continuation of the auxiliary track already laid.
- Casting of cc foundations for anchoring of winches at a distance of 90M on BPQ end 70m on KZJ end for pulling and restraining the CH span.
- Anchoring of 20t capacity winches 2 nos at distance of 90m at KZJ end for pulling and 10t capacity 2 nos on BPQ end at a distance of 70m for restraining.
- Providing steel wire ropes of 25mm dia on all the 4 winches over the pulleys blocks of 3sleeve, 2 sleeve and single sleeve.

11) ASSEMBLING AND LAUNCHING OF CH SPAN

- Assembling of 155` main span including 130` launching nose consisting of 15X10`and 13X10`

CALENDER HAMILTON GIRDER



ELEVATION AND PLAN OF LAUNCHING NOSE AND PART OF MAIN SPAN



panels respectively was done in three shifts round the clock with 40 Bridge staff in each shift. One 40t road crane engaged during assembling operation. Launching nose completed with in 4 days and main span was completed in 11 days including launching.

- The process of assembling and pulling was continued till the main span reaches on the two crib staging.
- After positioning the main girder the launching nose was dismantled and stacked.
- With the help of MFD jacks the span was lifted at one end and removed auxiliary track under the girder, inserted the bearings over the hard wood packing and rail clusters, lowered the span on the bearings and fixed with bolts. Cross level and longitudinal level was maintained correctly. The same thing was carried out at the other end also.
- All the arrangements of winches pulleys, wire ropes,

auxiliary track etc removed, track linked over CH span with wooden sleepers and on approaches with the existing line, including OHE connected.

- Trial run conducted and track certified for fit for traffic with stop dead proceed with 10kmph over the span.
- The above work is completed within 15 days as targeted.

12) PRECAUTIONS TO BE TAKEN DURING LAUNCHING:

- Checking of staging for stability.
- Tightening of the bolts and nuts properly.
- Jacking points shall be always on panel points.
- The rocker bearing bases to be checked for any cross level variations daily.
- Perfect tightening of bolts to be ensured before the launching of CH span in position to avoid sag during launching itself rather than tightening later on.
- Cross level and sag are two important factors to be taken care off in CH span.

13) PROBLEMS EXPERIENCED DURING LAUNCHING OF CH SPAN

- During launching, the level of launching nose was lower by 30 cms, with respect to auxiliary track on receiving end on KZJ. Hence the launching nose, after reaching up to the staging had to be lifted and brought to the auxiliary track level.
- During launching operation, the centerline of the receiving end auxiliary track was not in the alignment of approaching launching nose. For this, the auxiliary track had to be realigned.

- For avoiding the above problems, it is to be ensured that while laying the auxiliary track, on both approaches should be in the same level and alignment and receiving end track shall be slightly lower.

- The parts of the CH SPAN are received in wagons were unloaded in a restricted place due to place constraint in between two tracks which has taken a lot of time in sorting out all the parts and supplying for the erection batches in continuous shifts.

- The wire ropes of dia 25mm and 700 metres each unloaded from the wagons were in zig zag condition with so many knots. The same were unfolded and spread over a length of 700 metres with great difficulty. 25 staff were on this job for one complete day.

14) MAINTENANCE OF CH SPAN IN TRACK

- Checking the deflection, cross levels, longitudinal level and alignment of CH span.

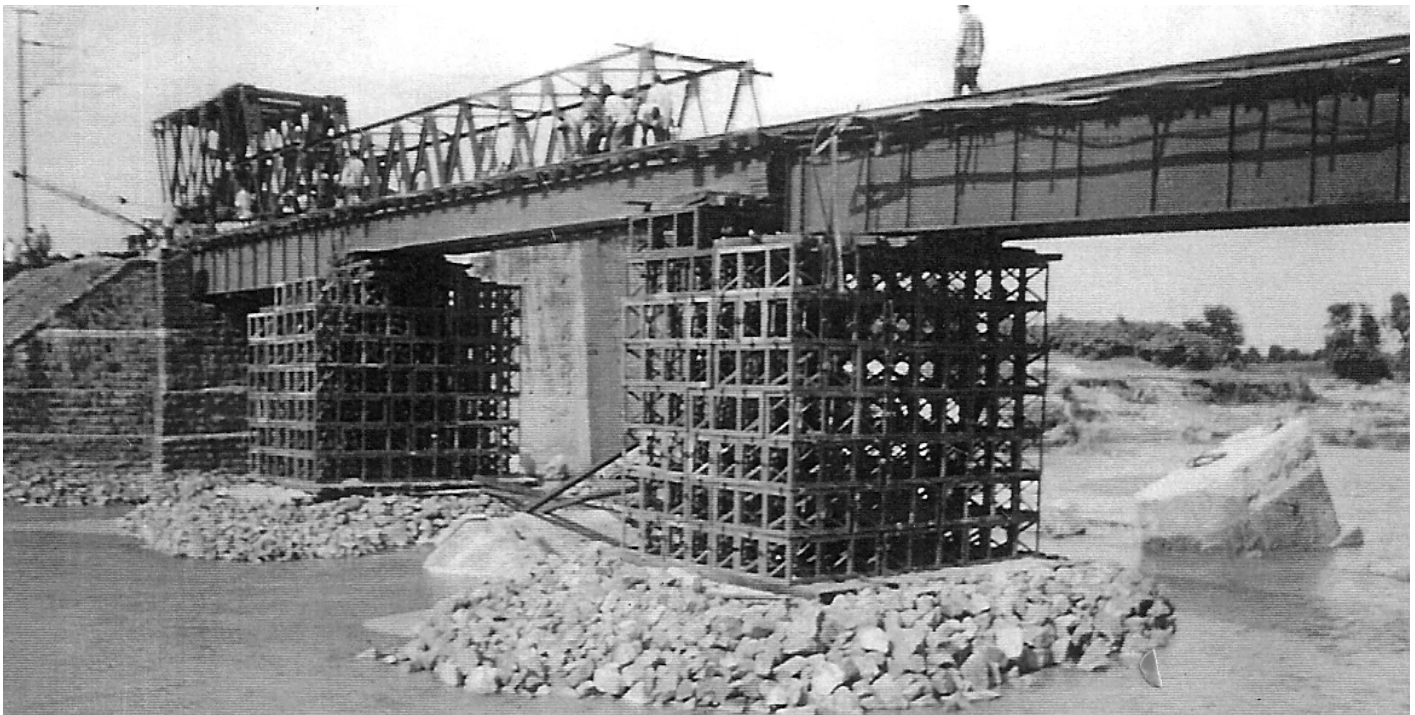
- If require attending all defects duly lifting and giving hard wood packing
- Tightening the bolts regularly to minimize the deflection of the span duly arranging scaffolding arrangements.
- Arranging power blocks for tightening of the bolts on OHE portion.
- Approaches are packed and cross level attended.
- Tightening of the crib staging clamp bolts.

14) A FINAL WORD :

- Generally CH spans are used as semi permanent

bridges where there is no accessibility to go for temporary crib staging in the river bed due to deep waters/flow/deep valleys, till the permanent solutions are made.

- In case of washout of both the lines in double line section where further floods are expected which may endanger the temporary arrangement of sub-structure built in the river bed, the scheme to restore the traffic in one line with R H girder/Service girder with temporary stagings immediately and go for restoring the on other line with Calendar Hamilton girder of suitable span, is a wise one and takes care of any eventuality.



SITE VIEW DURING LAUNCHING

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